东北大学秦皇岛分校本科课程教学大纲

一、课程基本信息

<table>
<tr><td>开课单位</td><td colspan="3">东北大学悉尼智能科技学院</td><td>课程代码</td><td colspan="5">3100212003</td></tr>
<tr><td>中文名称</td><td colspan="8">工程领导力</td></tr>
<tr><td>英文名称</td><td colspan="8">Engineering Communication</td></tr>
<tr><td>总学时</td><td>48</td><td rowspan="2">理论学时</td><td rowspan="2">48</td><td rowspan="2">实验学时</td><td rowspan="2">0</td><td rowspan="2">上机学时</td><td rowspan="2">0</td><td rowspan="2">设计学时</td><td rowspan="2">0</td><td rowspan="2">课外学时</td><td rowspan="2">0</td></tr>
<tr><td>学　分</td><td>3</td></tr>
<tr><td>课程类型</td><td colspan="8">☑理论课程　□理论（含实验）课程　□实践类课程</td></tr>
<tr><td>课程类别</td><td colspan="8">□通识类　☑学科基础类　□专业方向类　□实践类</td></tr>
<tr><td>适用专业</td><td colspan="8">计算机科学与技术、通信工程</td></tr>
<tr><td>先修课程</td><td colspan="8">C++程序设计基础</td></tr>
<tr><td>建议开课学期</td><td colspan="8">□1-1 ☑1-2 □2-1 □2-2 □3-1 □3-2
□4-1 □4-2 □5-1 □5-2 □*（代表每学期都开设）</td></tr>
<tr><td>考核方式</td><td colspan="3">□考试 ☑考查</td><td>成绩分制</td><td colspan="4">☑百分制 □五级制 □二级制</td></tr>
<tr><td>使用教材</td><td colspan="8">Dowling D., Hadgraft R., Carew A., McCarthy T., Hargreaves D., Ballie C., Male S. Engineering Your Future - An Australasian Guide (Fourth Edition). Wiley, 2019.</td></tr>
<tr><td>参考书及教学资源</td><td colspan="8">云校园 https://lms.cloudcampus.com.cn/courses/13/modules</td></tr>
<tr><td>其他说明</td><td colspan="8">无</td></tr>
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二、课程简介

中文描述

本课程通过澳大利亚无国界工程师（Engineers Without Borders, EWB）挑战赛，以实际工程项目为依托，培养学生的专业工程实践技能。学生以小组为单位，针对 EWB 挑战赛项目指南中提出的特定问题，制定恰当的解决方案。在培养学生工程实践中应具备的有效沟通和团队合作能力的同时，还能加深学生对专业工程师的社会、文化、经济和环境责任的理解。本课程是学生在整个学习生涯以及日后职业生涯中，作为专业工程师进行持续专业发展的起点。

本课程所介绍的技能包括：理解和应用人际沟通的原则和理论；研究可为工程项目设计开发提供解决方案的各学科领域；应用工程设计流程来识别、制定和设计工程问题的解决方案；依托工程应用背景的书面和口头交流能力；通过视觉交流表达相关工程概念；以及领导和参与团队进程。同时，本课程注重过程性评价，为学生提供了多种评估机会，让他们在提交团队终结性评估内容之前获得阶段性反馈并不断完善自己的项目成果。

English Description

This subject develops students' professional engineering practice skills within the context of a real-life engineering project, through the Engineers Without Borders (EWB) Challenge. Students work in teams to create an appropriate design solution for a given problem as set out in the EWB Challenge Design Brief. While applying the central role of effective communication and teamwork in engineering practice, students develop an understanding of the social, cultural, economic and environmental responsibilities of a professional engineer. This subject is a starting point for students' ongoing professional development that they undertake throughout their studies and as a professional engineer in their career.

The skills introduced include understanding and applying principles and theories of human communication; researching the various discipline areas that inform the development of an engineering design solution; applying the engineering design process to identify, formulate and design a solution to solve a problem; written and oral communication for engineering contexts; expressing engineering concepts through visual communication; and, leading and participating in team processes. This subject provides multiple assessment opportunities for students to receive feedback and develop their work before submitting a summative team assessment.

三、课程目标

1、知识目标：

1-1：掌握专业工程领域的基本沟通原理。

1-2：学会使用工程设计步骤定义问题并制定解决方案。

1-3：掌握查找、评估、引用和整合信息资源的基本技能。

1-4：认知专业工程实践的社会、文化和环境责任

2、能力目标：

2-1：具有卓越的工程技术素养，具备突出的信息技术与工程实践技能。

2-2：具备在工程技术及计算机相关领域，通过科学的理论和方法创造性地解决复杂问题、从事学术前沿问题研究的能力。

2-3：具备良好的团队合作能力、项目管理能力与领导力。

3、德育/素养目标：

3-1：以创新为动力，培养具有自学能力、创新意识、实践能力及团体协作能力的技能应用型人才。

3-2：具有良好的跨文化、跨领域沟通能力，能够在计算机、通信、电子信息等领域进行有效的技术沟通和交流。

3-3：具备一定的科学思维、科学精神和科学素质，培养学生善于解决问题的实践能力。

表 1 课程目标与毕业要求的对应关系

毕业要求	指标点	课程目标	关联 (H/M/L)
1．工程知识：能够将数学、自然科学、工程基础和专业知识用于解决复杂工程问题。	1.3 了解本专业涉及相关行业的发展趋势以及相关产业的运营模式，具备在本专业相关领域进行工程设计、技术创新的能力。	1-1、1-2、1-3、1-4、2-1、2-2、3-1、3-2、3-3	H
9．个人与团队：能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。	9.1 能够认识团队协作的重要性，具有强烈的团队协作意识和能力、卓越的组织管理能力、较强的表达能力和人际交往能力。	1-1、1-2、1-3、1-4、2-1、2-2、2-3、3-1、3-2、3-3	H
	9.2 具有良好的跨文化、跨领域沟通交流能力，适应本专业相关行业的团队协作机制，积极主动的在团队中发挥作用。	1-1、1-2、1-3、1-4、2-1、2-2、2-3、3-1、3-2	M
10. 沟通：能够就本专业复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。具备一定的国际视野，能够在跨文化背景下进行沟通和交流。	10.2 熟练掌握英语，能够在本专业相关领域进行有效的技术沟通和交流。	1-1、1-2、1-3、2-1、2-2、2-3、3-1、3-2	M
11．项目管理与财务：理解并掌握工程管理原理与经济决策方法，并能在多学科环境中应用。	11.1 掌握基本的工程管理原理和经济决策方法，能对计算机相关领域的新技术、新应用进行技术分析和比较。	1-1、1-2、2-1、2-2、3-1、3-2、3-3	L
	11.2 具有良好的组织、管理和领导能力，能够将本专业相关工程管理原理与经济决策方法应用于多学科环境中。	1-1、1-3、2-2、2-3、3-1、3-2	H

四、主要教学内容

（一）理论教学

第 1 章：Introduction to Engineering and the Design Process（支撑教学目标 1-1、1-2、2-1、2-2、3-1、3-2）

【1】知识点：

(1) The introduction to engineering.

(2) The introduction to the design process.

【2】学习目标：

理解：The definition and characteristics of engineering problem; Porotype and significance of Engineering design.

掌握：The general design processes; Master the module of group collaboration.

【3】重点内容：

(1) Definition of engineering problem and process.

(2) The process of an engineering design.

【4】难点内容：

(1) How to define an engineering problem and the processes of an engineering design.

(2) Behavior and communicate well in group collaboration.

第 2 章：Getting started on the EWB Challenge（支撑教学目标 1-1、1-2、2-1、2-2、3-1、3-2）

【1】知识点：

(1) Engineers Without Borders Brief.

(2) Evaluating information sources.

(3) Background about Yirrganydji.

【2】学习目标：

理解：Engineers Without Borders Brief.

掌握：Evaluating information sources; The concept of CRAP criteria.

【3】重点内容：

(1) How to evaluate information sources.

【4】难点内容：

(1) The concept of CRAP criteria.

第 3 章：Referencing, Academic Integrity, Project Stakeholders and Forming Teams（支撑教学目标 1-1、1-2、1-3、2-1、2-2、2-3、3-1、3-2）

【1】知识点：

(1) Referencing.

(2) Academic integrity.

(3) Project stakeholders.

(4) Forming Teams.

【2】学习目标：

理解：Academic integrity; Project stakeholders; Forming Teams.

掌握：Referencing.

【3】重点内容：

(1) How to reference properly.

【4】难点内容：

(1) Project stakeholders analysis.

第 4 章：Empathy, Defining your Design Problem, and Time Management（支撑教学目标 1-1、1-2、1-4、2-1、2-2、2-3、3-1、3-3）

【1】知识点：

(1) Empathy and engineering design.

(2) Defining your design problem.

(3) Time management

【2】学习目标：

理解：Why do we build empathy with stakeholders; Time management.

掌握：Defining the design problem.

【3】重点内容：

(1) Definition of design problem.

【4】难点内容：

(1) Definition of design problem.

(2) Time management and project task management.

第 5 章：Brainstorming and Decision Making（支撑教学目标 1-1、1-2、2-1、2-2、3-1、3-2、3-3）

【1】知识点：

(1) Brainstorming ideas.

(2) Fundamental elements of decision-making.

(3) Engineering documentation: Analyzing an industry consulting report.

【2】学习目标：

理解：How to use brainstorming techniques to shift from defining their design problem statement to ideating potential design solutions; how to build skills in systematic decision making, clearly identifying decision criteria, justifying and explaining decisions to meet their primary goals; What professional engineering writing looks like.

掌握：Brainstorming techniques; Decision matrix; Decision criteria.

【3】重点内容：

(1) Strategy of brainstorming.

(2) The use of decision matrix**.**

【4】难点内容：

(1) Brainstorming to ideate potential project design solutions.

(2) Screening ideas to final design.

第 6 章：Engineering writing and Synthesizing information（支撑教学目标 1-1、1-2、1-3、2-2、2-3、3-1、3-2、3-3）

【1】知识点：

(1) Basic writing skills of engineering report.

(2) Case study on the studied area.

(3) Survival game analysis.

【2】学习目标：

理解：Paragraphing in reports for engineering writing.

掌握：Specification and skills of wiring engineering report.

【3】重点内容：

(1) Practicing writing of engineering reports.

(2) Synthesizing information and communicating.

【4】难点内容：

(1) The methods for Paragraphing and synthesizing information.

(2) Learn to work more coherently as a group.

第 7 章：Bias and Assumptions（支撑教学目标 1-1、1-3、1-4、2-1、2-2、2-3、3-1、3-2、3-3）

【1】知识点：

(1) The concept of biases and assumptions.

【2】学习目标：

理解：Challenging our biases and assumptions to finalize design criteria.

掌握：What assumptions they might be making based on biases they already have.

【3】重点内容：

(1) How bias and assumptions can be detrimental to designs.

(2) Summarize the plan for the project solution.

【4】难点内容：

(1) Identify design criteria that aren't based on incorrect assumptions.

【5】思政案例：

Team breakout to solve the following mystery:

"It is a hot summer afternoon. We are in the loungeroom of an old Victorian mansion. There is a large window open and the curtains are blowing in the breeze generated by the thunderstorm that just passed through the area. On the floor are the bodies of Liang Shanbo and Zhu Yingtai. They are surrounded by puddles of water, broken glass, and a broken bottle of wine. The family cat cowers in the corner. What happened?"

One solution is: Romeo and Juliet are fish - due to the storm, the wind blew their aquarium and the bottle of wine onto the floor.

Base incorrect assumption: Romeo and Juliet are people.

Encourage students to note down any assumptions that their team makes and notify the role of critical thinking in identifying bias and challenging assumptions.

第 8 章：Report Writing and Prototypes（支撑教学目标 1-1、1-2、1-3、2-1、2-2、3-1、3-2、3-3）

【1】知识点：

(1) The methods of writing concisely.

(2) Focusing on prototyping of practical engineering problems.

【2】学习目标：

理解：The structure of the report and the methods of writing concisely; How to start prototyping; Focusing on prototyping of practical engineering problems.

掌握：Different ways for rapid, low-fidelity prototyping; Practical guidelines for prototype designs.

【3】重点内容：

(1) What is expected for a final team report and detailed design.

(2) Validate, test, iterate and communicate your idea.

【4】难点内容：

(1) Determine what to prototype and plan out how that prototype can be made.

(2) Mixing social, cultural, economic and environmental elements into prototype designs.

第 9 章：Design Forum and Group Work（支撑教学目标 1-1、1-4、2-2、3-1、3-2、3-3）

【1】知识点：

(1) The team development reflection.

(2) Tuckman's 5 stages of team development.

(3) Lencioni model of team effectiveness.

【2】学习目标：

理解：Self-management within groupwork; Tips for effective group work; Minimising 'freeloading' in groupwork.

掌握：Academic word list (AWL); Highlight academic word in writing; The meaning of detailed design.

【3】重点内容：

(1) How to find (detailed, specific) information.

(2) Technical and broader considerations.

(3) The demonstration of the design solution.

【4】难点内容：

(1) Academic word list (AWL).

(2) Highlight academic word in writing.

第 10 章：Sustainability and Report Writing（支撑教学目标 1-3、1-4、2-2、3-1、3-2、3-3）

【1】知识点：

(1) Structuring an engineering report.

(2) The difference between writing a report introduction and conclusion.

(3) How to write your introduction, body, and conclusion.

【2】学习目标：

理解：United Nations Sustainable Development Goals (SDGs); What is humanitarian engineering; The Triple Bottom Line (TBL) model.

掌握：Writing introductions; Writing conclusions; The meaning of detailed design.

【3】重点内容：

(1) Tools for simplifying the writing.

(2) Changing nouns into adjectives.

(3) Writing introductions and conclusions.

【4】难点内容：

(1) Concise engineering writing.

(2) Sustainability.

(3) The Triple Bottom Line (TBL) model

第 11 章：Effective Presentation Skills and Writing an Executive Summary（支撑教学目标 1-3、1-4、2-3、3-1、3-2、3-3）

【1】知识点：

(1) Writing an executive summary.

(2) Presentation skills and presentation slides.

(3) Lencioni model of team effectiveness.

【2】学习目标：

理解：Self-management within groupwork; Design solution appropriate to the community context; Clear problem definition and scope.

掌握：Detail design solution and feasibility, design prototype; Design solution presented with justified decision-making, design criteria, costings and implementation plan.

【3】重点内容：

(1) Finalise the team's detailed design.

(2) Finalise the team's report and presentation slides.

(3) The final report checklist on Cloud Campus.

【4】难点内容：

(1) Completeness of information.

(2) Quality and clarity of expression.

(3) Correct referencing

第 12 章：Team Final Presentations（支撑教学目标 1-1、1-4、2-3、3-1、3-2、3-3）

【1】知识点：

(1) Visual presentation aids.

(2) Body language and voice delivery of presentation.

(3) Structure of presentation.

【2】学习目标：

理解：Audience engagement; Body language; Voice delivery of presentation.

掌握：Structure of presentation; Based on research and relevant to context with level of technicality suited to the audience/purpose.

【3】重点内容：

(1) Voice: needs to be clear and loud.

(2) Speed: Consciously slow down. Slower speech tends to sound more authoritative.

(3) Tone: Use your voice to emphasize key points.

【4】难点内容：

(1) Each team to share back on their evaluation of team presentation.

(2) Use the Mural as prompts.

五、教学安排与学时分配

This subject develops students' professional engineering practice skills within the context of a real-life engineering project. Students work in teams to create an appropriate design solution for a given problem. Each week students are expected to prepare for and attend a 2-hour tutorial and 2-hour workshop. To prepare, students are expected to complete a set of online pre-class tasks provided on CloudCampus. During tutorial classes, students will build on the pre-class tasks to learn and apply new skills. These skills will be practiced in class and are designed to be relevant to the tasks involved in the EWB Challenge team project. Areas of learning in tutorial classes include problem solving, team building, exploring scenarios, design and build activities, project management, reflection and group discussion. Activities support acquisition of professional engineering skills in a small group setting under the supervision of a tutor; these skills relate directly to major team EWB Challenge project. The weekly 2-hour workshop will be students' opportunity to discuss and ask their teaching team questions about the project or about the tutorial, it is also a chance to work on the project as a team.

表 3 学时分配表

讲课内容		学时				
		讲课	实验	上机	设计	课外
第 1 章	Introduction to Engineering and the Design Process	4	0	0	0	0
第 2 章	Getting started on the EWB Challenge	4	0	0	0	0

第 3 章	Referencing, Academic Integrity, Project Stakeholders and Forming	4	0	0	0	0
第 4 章	Empathy, Defining your Design Problem, and Time Management	4	0	0	0	0
第 5 章	Brainstorming and Decision Making	4	0	0	0	0
第 6 章	Engineering writing and Synthesizing information	4	0	0	0	0
第 7 章	Bias and Assumptions	4	0	0	0	0
第 8 章	Report Writing and Prototypes	4	0	0	0	0
第 9 章	Design Forum and Group Work	4	0	0	0	0
第 10 章	Sustainability and Report Writing	4	0	0	0	0
第 11 章	Effective Presentation Skills and Writing an Executive Summary	4	0	0	0	0
第 12 章	Team Final Presentations	4	0	0	0	0
小计		48	0	0	0	0
总计	48					

六、教学方法

1、Multi-media-based lecturing.

2、Combining theory with engineering practical problems.

3、Problem-based learning and team collaborating.

七、成绩评定

1、**Regular Performance (Weight 20%):** Pre-class quizzes, in-class performance, and random questions from teachers are comprehensively evaluated. Among them, the pre-class quizzes accounts for 50%, in addition, the in-class performance and the random questions from teachers account for 50%, the full score is 100.

2、**Mid-term (Weight 30%):** Individual background research report and reverse project brief are comprehensively evaluated. Among them, the individual background research report accounts for 50%, the reverse project brief accounts for 50%, the full score is 100.

3、**Final Exam (Weight 50%):** Final report and final presentation are comprehensively evaluated. Among them, the final report accounts for 60%, and the final presentation accounts for 40%. The final report is evaluated by the group work, and final presentation is evaluated by the group and individual work, the full score is 100.

八、评价及持续改进

1、**Syllabus**

Check Period: 4 years; Revise Period: 4 years.

Improvement Mechanism: The subject coordinator shall be responsible for the syllabus discussion and improvement, and the revised version shall be submitted to deputy dean (teaching affairs) for reviewing then to executive dean for improvement.

2、**Grade Evaluation and Assessment**

Cycle: 1 year; Evaluation Basis: Comprehensive analysis of students' final grades.

Improvement Mechanism: Adjust and optimize the subject content accordingly based on the distribution of students' final grades and improve teaching methods.

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